STORMWATER MANAGEMENT REPORT

PROPOSED RETAIL MOTOR FUEL OUTLET RE-DEVELOPMENT
MAP U45 LOTS 7, 7-B, 8-A & 11-0
254, 256 & 260 AYER ROAD (ROUTE 2A)
LITTLETON, MA

MAP 30 LOT 16
0 LITTLETON ROAD
AYER, MA

GPI

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Prepared For:

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February 8, 2023

Energy North Group
Proposed Retail Motor Fuel Outlet
Stormwater Management Report

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SECTION 1 EXECUTIVE SUMMARY

Greenman-Pedersen, Inc. (GPI) has prepared this analysis of the stormwater management system for the proposed retail motor fuel outlet re-development located at 254, 256 & 260 Ayer Road (Route 2A/110) in Littleton, Massachusetts and 0 Littleton Road in Ayer, Massachusetts. This analysis includes pre-development and post-development calculations or stormwater runoff rates from the project site. The analysis has been prepared in accordance with the Town of Ayer and Town of Littleton requirements and the Stormwater Management Standards of the Massachusetts Department of Environmental Protection (MassDEP) Massachusetts Stormwater Policy. The design is intended to interface with the improvements proposed as part of the MassDOT project #608443 which will reconstruct Route 2A along the site frontage.

The project site consists of five parcels total. Three parcels south of Ayer Road identified as Map U45 Lots 7-0, 7-B & 8-A (located in Littleton, MA) total approximately 2.79 acres and comprise the primary development area. Two parcels north of Ayer Road identified as Map U45 Lot 11-0 (located in Littleton, MA) and Map 30 Lot 16 (located in Ayer, MA) total approximately 0.52 acres and are ancillary to the primary development. The site south of Ayer Road is bounded by Ayer Road to the north, the intersection of Ayer Road and Bruce Street to the northeast, private residences along Bruce Street to the east, and wooded area to the south and west containing a campground.

The applicant, Energy North Group, proposes to redevelop the existing three parcels into a single development by demolishing the existing buildings and retail motor fuel outlet to construct a new retail motor fuel outlet. The re-development will include a 6,000 square foot convenience store, a new retail fuel canopy with five (5) dispensers (10 fueling positions), a new high-speed diesel fuel canopy with three (3) dispensers (2 fueling positions), three (3) new double-wall fiberglass underground fuel storage tanks, and an associated paved parking lot and driveways.

This project, which is considered a mix of redevelopment and new development under the DEP Stormwater Management Standards, provides on-site stormwater runoff management improvements over the existing site conditions.

In order to mitigate increases in peak discharge rates of stormwater runoff as a result of the new impervious surfaces, a new comprehensive stormwater management system has been designed that includes deep-sump, hooded catch basins, First Defense hydrodynamic separator units, an oil/water separator, two underground infiltration systems, a sediment forebay, an aboveground infiltration basin, and a bioretention area. The BMP's included in the proposed stormwater system are designed in accordance with the MassDEP Stormwater Management Standards to improve stormwater quality and quantity at the design points.

Based on site topography and discharge points, three design points are utilized for the purpose of this analysis. Design Point #1 represents Ayer Road. Design Point #2 represents the rear of the adjacent property to the east. Design Point #3 represents Willow Road.

The table below summarizes the comparative pre- and post-development peak rates of stormwater runoff at the design points.

TABLE 1: PEAK RATE ANALYSIS SUMMARY

Design Storm	Pre-Development (cfs)	Post-Development (cfs)	Change (cfs)
Design Point #1 – Ayer Road			
2-year	1.1	0.1	-1.0
10-year	3.0	0.8	-2.2
25-year	4.8	1.6	-3.2
100-year	8.6	4.7	-3.9
Design Point #2 – Adjacent Property (east)			
2-year	0.5	0.2	-0.3
10-year	1.4	0.6	-0.8
25-year	2.3	1.0	-1.3
100-year	4.1	1.7	-2.4
Design Point #3 – Willow Road			
2-year	1.2	0.0	-1.2
10-year	2.1	0.4	-1.7
25-year	2.8	1.0	-1.8
100-year	4.3	2.1	-2.2

(All values shown are peak rates in CFS)

In conclusion, by incorporating a new on-site drainage system that includes provisions for stormwater treatment, recharge and detention, there will be a reduction in peak rates of runoff at the Design Points as a result of the project during all storms analyzed.

Implementing the maintenance procedures outlined in the Operation and Maintenance Plan (O&M) will ensure the long-term performance of the system.

SECTION 2 EXISTING CONDITIONS

The project site consists of five parcels total. Three parcels south of Ayer Road identified as Map U45 Lots 7-0, 7-B & 8-A (located in Littleton, MA) total approximately 2.79 acres and comprise the primary development area. Two parcels north of Ayer Road identified as Map U45 Lot 11-0 (located in Littleton, MA) and Map 30 Lot 16 (located in Ayer, MA) total approximately 0.52 acres and are ancillary to the primary development. The site south of Ayer Road is bounded by Ayer Road to the north, the intersection of Ayer Road and Bruce Street to the northeast, private residences along Bruce Street to the east, and wooded area to the south and west containing a campground.

The site contains an existing retail motor fuel outlet with a 1,983 square foot convenience store, a retail fuel canopy with 4 dispensers, a diesel dispenser in the eastern portion of the site, and an associated paved parking lot. The rear (southern) portion of the site contains a 1,974 square foot building housing a tire recycling business. Parcel U45-8-A, which represents the western portion of the project site, is currently undeveloped and contains grassed and wooded areas throughout. Access is provided via two full-access driveways along Ayer Road.

Site topography generally slopes from south to north from a high elevation of 284 at the southern corner of the property to a low elevation of 253 at the northeast property corner along Ayer Road.

The two parcels north of Ayer Road consist of an existing paved parking area with wooded area to the north. Topography in that area slopes south to north from a high elevation of 254 along Ayer Road to a low elevation of 250 at the northern property corner.

Stormwater runoff from the existing development is either captured by one of several existing on-site catch basins or sheet flows over pavement uncontrolled into Ayer Road. It is unclear by survey and record plans where piped outlets from the on-site catch basins are directed, however, it is assumed that all flow eventually discharges into Ayer Road without treatment. Runoff from pervious areas flows over land to the north eventually into Ayer Road. Runoff from the southeastern portion of the site flows over land through woods to the east off-site to the rear of the abutting property. Currently, stormwater runoff receives no treatment or peak flow attenuation prior to discharging off-site eventually into the Ayer Road drainage system.

Stormwater runoff from the parcels north of Ayer Road flows uncontrolled over pavement and through woods to the northeast eventually to Willow Road.

The NRCS Web Soil Survey identifies on-site and surrounding soils as Canton-Charlton-Urban land complex and Hollis-Rock outcrop-Charlton complex with a Hydrologic Soil Group (HSG) classifications of ‘A’ and ‘D’ respectively. Refer to Appendix D for more information.

Test pits were performed by Greenman-Pedersen, Inc. (GPI) on December 15, 2022. The pits included several for drainage system design and others for septic system design. Test pits for drainage encountered sand and gravel as well as loamy sand overlain by fill (up to 5' thick). Test pits #2 - #4 were excavated to depths of nearly 10' with no redoximorphic features or refusal encountered. Test Pit #1 was performed on the property north of Ayer Road and encountered similar soil conditions with no redoximorphic features or refusal to 100" below ground.

There are no wetlands on or immediately adjacent to the site. The site is not located within a special flood hazard area (100-year flood) per insurance rate map number 25017C0216E, with an effective date of June 4, 2010.

SECTION 3 PROPOSED CONDITIONS

The applicant, Energy North Group, proposes to redevelop the existing three parcels into a single development by demolishing the existing buildings and retail motor fuel outlet to construct a new retail motor fuel outlet. The re-development will include a 6,000 square foot convenience store, a new retail fuel canopy with five (5) dispensers (10 fueling positions), a new high-speed diesel fuel canopy with three (3) dispensers (2 fueling positions), three (3) new double-wall fiberglass underground fuel storage tanks, and an associated paved parking lot and driveways.

To serve the redevelopment, the existing easterly driveway will remain and be slightly reconfigured to be an exit-only driveway. The existing driveway to the west will be closed and a new full-access driveway will be constructed further west with geometry to accommodate turning movements for WB-67 trucks.

The project will result in an increase in impervious area of approximately 45,700 square feet and is therefore considered a mix of redevelopment and new development under the DEP Stormwater Management Standards. The proposed design will provide on-site stormwater runoff management improvements over the existing site conditions.

In order to mitigate increases in peak discharge rates of stormwater runoff as a result of the new impervious surfaces, a new comprehensive stormwater management system has been designed that includes deep-sump, hooded catch basins, First Defense hydrodynamic separator units, an oil/water separator, two underground infiltration systems, a sediment forebay, an aboveground infiltration basin, and a bioretention area.

The BMP's included in the proposed stormwater system are designed in accordance with the MassDEP Stormwater Management Standards to improve stormwater quality and quantity at the design points. Underground drainage pipes have been sized to accommodate the 25-year storm event.

Runoff from the building roof, retail canopy, and diesel canopy will be directed through pipes to an underground infiltration system (UG-INF-2) consisting of Stormtech MC-3500 chambers surrounded by crushed stone. The volume of the system has been designed to maximize the amount of roof runoff recharge. A 6" HDPE outlet pipe is provided as an emergency overflow which is directed back into the on-site drainage system.

Runoff from paved surfaces in the southeastern, southern, and western portions of the site which do not have potential for fuel spills will be captured in deep sump catch basins with hooded outlets and directed through pipes to an underground infiltration system (UG-INF-1). This system consists of Stormtech MC-3500 chambers surrounded by crushed stone with manifold piping and an isolator row for additional pre-treatment prior to infiltration. Outlet control is provided via an outlet pipe and drain manhole to regulate flow rates from the infiltration system before

discharging into the closed drainage system downstream. The infiltration system volume has been designed to maximize the amount of on-site groundwater recharge in an effort to reduce the rate and volume of runoff ultimately leaving the site.

Paved surfaces in the northern and northeastern portions of the site including areas surrounding the dispensers and underground fuel tank pad have the potential for fuel spills and are considered land uses with a higher potential pollutant load (LUHPPL). Runoff from these areas will be captured in deep sump catch basins with hooded outlets and be directed through a First Defense hydrodynamic separator and an oil/water separator to remove floatables, fine particles, and provide storage for fuels/oils in the event of a spill. Runoff will then enter a sediment forebay with an impermeable liner and an aboveground infiltration system to provide treatment and groundwater recharge. An emergency overflow pipe will allow larger storm events to discharge into the closed drainage system within Ayer Road.

As part of the re-development, all existing on-site catch basins are to be removed, with the exception of one to remain in the driveway. The majority of stormwater runoff from the existing site, as described above, currently discharges into Ayer Road with no stormwater treatment, however, due to limited record information the exact pipe discharge points are not known. Accordingly, a new drain overflow connection to the Ayer Road drainage system is proposed to convey treated overflow from the site which is not otherwise infiltrated on-site.

The project will also improve the quantity and quality of the runoff from the two parcels north of Ayer Road by constructing a new bioretention area with rip rap apron to treat runoff from the paved parking area by filtering it through a designed media before infiltrating into the underlying soil or discharging off-site to Willow Road.

An Operation & Maintenance Plan (O&M) will be implemented to safeguard against future intrusion of contaminants and TSS and ensure proper maintenance and function of all drainage components.

To prevent erosion and sedimentation during construction, Best Management Practices including stabilized construction entrances, silt fence, catch basin inserts, and temporary and permanent seeding have been incorporated into the construction sequence.

The total area of disturbance related to the proposed construction on this property is approximately 122,000 square feet, therefore, the project is subject to a US EPA Construction General Permit under the NPDES program.

Stormwater Quality Controls:

1. **Street Sweeping** - to capture sediment prior to entering the drainage system. This would be done on a scheduled basis. TSS Removal Rate = 5%

2. **Catch Basins with Deep Sumps and Hooded Outlets** to capture, pretreat, and direct stormwater to the proposed treatment devices. TSS Removal Rate = 25%
3. **First Defense units** – to provide pretreatment and TSS removal of stormwater runoff prior to entering downstream BMPs. TSS removal rate = 70%
4. **Oil/Water Separator** – to provide additional pretreatment, as well sediment & oil storage capacity prior to discharge to the underground detention system. TSS Removal Rate = 25%
5. **Underground Infiltration Systems** - to recharge convenience store and canopy rooftop runoff & runoff from non-LUHPPL pavement areas. TSS removal rate = 80%
6. **Sediment Forebay** – to provide pretreatment through gravity settling of suspended solids. TSS removal rate = 25%
7. **Aboveground Infiltration Basin** - to recharge runoff from pavement areas. TSS removal rate = 80%
8. **Bioretention Area** – to provide treatment through filtration, microbe activity, and uptake by plants. TSS removal rate = 90%

Groundwater Recharge:

Groundwater recharge is provided in the underground infiltration systems, aboveground infiltration basin, and bioretention area.

Stormwater Quantity Controls:

The stormwater management system has been designed to convey stormwater runoff from the site during the 25-year storm event. Peak flow rates of stormwater runoff are reduced though the use of two underground infiltration systems, an aboveground infiltration basin, and a bioretention area.

Stormwater Management Standards:

Standard #1: Untreated Stormwater

Full compliance:

- No new untreated stormwater discharges directly to wetlands or waters of the Commonwealth are proposed.

Standard #2: Post Development Peak Discharge Rates

Full compliance:

- Implementing the stormwater management system will result in a decrease in post-development peak flow rates compared with pre-development rates for all storms analyzed. Refer to Table 1 in Section 1.

Standard #3: Groundwater Recharge

Full Compliance

On-site groundwater recharge is provided through the use of two underground infiltration systems and a bioretention area.

In accordance with Massachusetts Stormwater Policy, the required groundwater recharge volume (Rv) is based on a target depth factor (F) over impervious areas. The target depth factors for HSG-A & D soils is 0.60 and 0.10 inches respectively. The on-site impervious area = 54,758 sf for A soils and 34,553 sf for D soils.

Required Groundwater Recharge Volume:

$$R_v = F * A_{impervious}$$

$$R_v = 0.60\ inches\left(\frac{1\ in}{12\ ft}\right) * 54{,}758\ sf = \mathbf{2{,}738\ c.f.}$$

$$R_v = F * A_{impervious}$$

$$R_v = 0.10\ inches\left(\frac{1\ in}{12\ ft}\right) * 34{,}553\ sf = \mathbf{288\ c.f.}$$

The total required groundwater recharge volume is **3,026 cubic feet**. The recharge volume provided is the volume within the system below the lowest outlet elevation (measured statically). See summary table below.

Groundwater Recharge Volume Provided		
BMP	**Elevation**	**Volume Provided**
Underground Infiltration System #1	250.00-252.65	**5,373 c.f.**
Underground Infiltration System #2	249.50 – 253.02	**2,357 c.f.**
Aboveground Infiltration Basin	250.00-252.00	**2,433 c.f.**
Bioretention Area	248.00-251.50	**320 c.f.**

Total Annual Recharge Volume Provided = 10,483 c.f.
(See Appendix G for HydroCAD summaries)

Standard #4: TSS Removal

Full Compliance

Water Quality Volume Calculations:

The proposed infiltration practices are designed to store and infiltrate the water quality volume (V_{WQ}) from its contributing paved impervious surfaces. The water quality volume (V_{WQ}) is the volume of impervious surfaces times the water quality depth (D_{WQ}). A water quality depth of 1 inch is used due to the soils having an infiltration rate greater than 2.4 inches per hour and the use classified as a land use with higher potential pollutant loads (LUHPPL).

Underground Infiltration System #1:

The contributing impervious area to the Infiltration Basin is 31,701 sf.

$$V_{WQ} = D_{WQ} * A_{impervious}$$

$$V_{WQ} = 1\ in \left(\frac{1\ in}{12\ ft}\right) * 31{,}701\ sf = \mathbf{2{,}642\ c.f.}$$

The infiltration basin provides storage capacity for a treatment volume of 5,373 cf of runoff and exceeds the required volume of 2,642 cf.

Aboveground Infiltration #1:

The contributing impervious area to the Infiltration Basin is 27,769 sf.

$$V_{WQ} = D_{WQ} * A_{impervious}$$

$$V_{WQ} = 1\ in \left(\frac{1\ in}{12\ ft}\right) * 27{,}769\ sf = \mathbf{2{,}314\ c.f.}$$

The infiltration basin provides storage capacity for a treatment volume of 2,433 cf of runoff and exceeds the required volume of 2,314 cf.

First Defense Units:

The proposed First Defense units are sized by the manufacturer to provide treatment of the water quality flow rate for each contributing area. The water quality flow rates at DMH-8(FD) and CB-8(FD) during a 1-inch water quality storm are 0.27 cfs and 0.26 cfs respectively. The proposed First Defense FD-4HC unit is NJDEP certified to treat runoff up to 1.50 cfs. Refer to the product brochure included in Appendix G.

Oil/Water Separator:
Refer to the detail sheet for information on the oil/water separator design.

TSS Removal Rates Summary:

BMP	TSS Removal Rate
Street Sweeping	5%
Deep Sump Catch Basin	25%
Oil/Water Separator	25%
First Defense Unit	70%
Underground Infiltration Systems	80%
Sediment Forebay	25%
Aboveground Infiltration Basin	80%
Bioretention Basin	90%

Treatment Train 'A'
Beginning Load: 1.00 x Street Sweeping removal rate (0.05) = 0.05
Load Remaining = 1.00 – 0.05 = **0.95**
Remaining Load: 0.95 x Catch Basin w/ deep sump removal rate (0.25) = 0.24
Load Remaining = 0.95 – 0.24 = **0.71**
Remaining Load: 0.71 x Isolator Row removal rate (0.25) = 0.18
Load Remaining = 0.71 – 0.18 = **0.53**
Remaining Load: 0.53 x Underground Infiltration System removal rate (0.80) = 0.42
Load Remaining = 0.53 – 0.42 = **0.09**
TSS Removal Rate = (1.00 – 0.09) **= 91%**

Treatment Train 'B'
Beginning Load: 1.00 x Street Sweeping removal rate (0.05) = 0.05
Load Remaining = 1.00 – 0.05 = **0.95**
Remaining Load: 0.95 x Catch Basin w/ deep sump removal rate (0.25) = 0.24
Load Remaining = 0.95 – 0.24 = **0.71**
Remaining Load: 0.71 x First Defense removal rate (0.70) = 0.50
Load Remaining = 0.71 – 0.50 = **0.21**
Remaining Load: 0.21 x Oil/ Water Separator removal rate (0.25) = 0.05
Load Remaining = 0.21 – 0.05 = **0.16**
Remaining Load: 0.16 x Sediment forebay removal rate (0.25) = 0.04
Load Remaining = 0.16 – 0.04 = **0.12**
Remaining Load: 0.12 x Aboveground Infiltration Basin removal rate (0.80) = 0.10

Load Remaining = 0.12 – 0.10 = **0.02**
TSS Removal Rate = (1.00 – 0.02) **= 98%**

Treatment Train 'C'
Beginning Load: 1.00 x Street Sweeping removal rate (0.05) = 0.05
Load Remaining = 1.00 – 0.05 = **0.95**
Remaining Load: 0.95 x First Defense removal rate (0.70) = 0.67
Load Remaining = 0.95 – 0.67 = **0.28**
Remaining Load: 0.28 x Oil/ Water Separator removal rate (0.25) = 0.07
Load Remaining = 0.28 – 0.07 = **0.21**
Remaining Load: 0.21 x Sediment forebay removal rate (0.25) = 0.05
Load Remaining = 0.21 – 0.05 = **0.16**
Remaining Load: 0.16 x Aboveground Infiltration Basin removal rate (0.80) = 0.13
Load Remaining = 0.16– 0.13 = **0.03**
TSS Removal Rate = (1.00 – 0.03) **= 97%**

Treatment Train 'D'
Beginning Load: 1.00 x Street Sweeping removal rate (0.05) = 0.05
Load Remaining = 1.00 – 0.05 = **0.95**
Remaining Load: 0.95 x Bioretention Area removal rate (0.90) = 0.86
Load Remaining = 0.95 – 0.86 = **0.09**
TSS Removal Rate = (1.00 – 0.09) **= 91%**

Collectively, the BMPs designed achieve at least 80% removal of the average annual total suspended solids (TSS) from stormwater runoff.

Standard #5: Land Uses with Higher Potential Pollutant Loads (LUHPPL)

Pollution Prevention:

- The project is classified as a land use with higher potential pollutant loads as a gas station. BMPs capable of removing oil and grease have been selected to mitigate any risk associated with potential petroleum spills.
- The site is designed with a canopy structure covering the fuel dispensing islands.
- Spill containment grooves, positive limiting barriers (PLB's), surrounding the entire fueling area are designed to capture any potential spills at the dispensing islands.
- The long-term pollution plan includes good housekeeping practices, preventative maintenance procedures and regular inspections.

Standard #6: Protection of Critical Areas

The site is located within a Zone II of a public water supply. Source control and pollution prevention measures are identified in the Long-Term Pollution Prevention Plan within the Operation and Maintenance Plan (O&M). BMPs have been selected that are suitable for protection of these areas.

Standard #7: Redevelopment Projects

The site is a mix of redevelopment and new development. The redevelopment portion of the project and is subject to Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6 to the maximum extent practicable.

As shown in the standards above, the project fully complies with the Stormwater Management Standards.

Standard #8: Erosion and Sediment Control

Full compliance:

- Erosion and sediment controls are incorporated into the project design to prevent erosion. An Erosion & Sediment Control Plan is included in the site plan set.

Standard #9: Operation and Maintenance Plan

Full compliance:

- A long-term Operation and Maintenance Plan meeting the requirements of this standard has been prepared and is included as a separate document.

Standard #10: Illicit Discharges

Full compliance:

- To the best of our knowledge, the site does not contain any illicit discharges. An illicit discharge statement is included below.

February 8, 2023

Town of Littleton Planning Board
Littleton Town Hall
37 Shattuck Street, PO Box 1305
Littleton, MA 01460

Re: 254, 256 & 260 Ayer Road (Route 2A)
Map U45 Lots 7, 7-B, 8-A & 11-0
Sub: Illicit Discharge Statement
Standard #10

Dear Board Members:

On behalf of our client, Energy North Group, we hereby state that to the best of our knowledge, no illicit discharges exist on the above referenced site and none are proposed with the site re-development plans. Implementing the pollution prevention plan measures outlined in the site redevelopment plans will prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease. Refer to the Grading & Drainage Plan from the site plan set for additional information.

Sincerely,
Greenman-Pedersen, Inc.

Cory Mason, P.E.
Project Engineer

February 8, 2023

Town of Ayer Planning Board
Ayer Town Hall
1 Main Street
Ayer, MA 01432

Re: 0 Littleton Road
Map 30 Lot 16
Sub: Illicit Discharge Statement
Standard #10

Dear Board Members:

On behalf of our client, Energy North Group, we hereby state that to the best of our knowledge, no illicit discharges exist on the above referenced site and none are proposed with the site re-development plans. Implementing the pollution prevention plan measures outlined in the site redevelopment plans will prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease. Refer to the Grading & Drainage Plan from the site plan set for additional information.

Sincerely,
Greenman-Pedersen, Inc.

Cory Mason, P.E.
Project Engineer